



# Sandia's Nuclear Deterrence Mission

*Ensuring the nation's stockpile is safe, secure and effective*

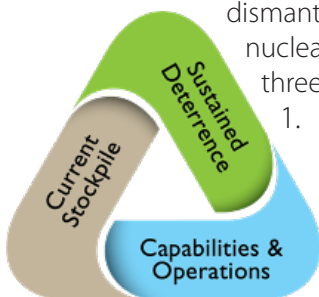
## Always and Never

Sandia performs a critical function for national defense: as the engineering arm of the nation's nuclear weapons enterprise, we ensure that nuclear weapons will always work when authorized by the president of the United States, but never work if not authorized, either by accident or ill-intent. This always/never principle ensures weapons meet the highest reliability requirements, as well as equally stringent safety and security requirements. Sandia is responsible for the non-nuclear components and system integration of U.S. nuclear weapons, which when integrated with the nuclear explosives package, maintain a militarily effective and sustainable U.S. nuclear deterrent.

Nuclear weapons must remain immediately available for decades in extremely complex conditions and survive in harsh environments. This requires systems engineering and demonstrated product delivery. Sandia's foundation is world-class, science-based engineering, in which basic science, computer models and unique experimental, test and production facilities come together to enable researchers to understand, predict and verify weapon system performance. People are Sandia's most important resource and the key to mission success in today's challenging era of dynamic global threats and an aging stockpile that requires Life Extension Programs (LEPs).

## Stockpile Readiness and Assessment

Within the U.S. nuclear weapons enterprise, Sandia is responsible for nuclear weapons and thousands of components, from original design through final dismantlement and disposition. Sandia's nuclear weapons mission is focused on three imperatives:



1. Assure viability of the current U.S. stockpile, through surveillance and other programs, and address the impacts of components that have a limited life.

2. Sustain U.S. deterrence into the future through LEPs and Alterations (ALT) by replacing aging technology and avoiding strategic surprise.
3. Maintain and advance Sandia's engineering and science capabilities, facilities and operations, and recruit and retain the next generation of talented, innovative and technical experts.

Sandia annually evaluates the reliability and safety of every active stockpile weapon and documents its findings in a letter from its director to the Secretary of Energy, the Secretary of Defense, and the chairman of the Nuclear Weapons Council. Reports from the directors of all three U.S. weapons labs, along with the assessment of the commander of the U.S. Strategic Command, form the basis for the annual formal report to the President of the United States on the overall condition of the nuclear weapons stockpile.

"Completing and signing Sandia's annual nuclear weapons stockpile assessment letter is perhaps the most important duty of the Labs director. It spells out in detail the safety, reliability, and performance of all elements of the U.S. nuclear stockpile for which Sandia is responsible. The process takes many months and involves exhaustive internal and external expert reviews on each weapon system, engaging many centers and most divisions across Sandia. This important letter is delivered to the secretaries of Energy and Defense and the chair of the Nuclear Weapons Council."

Laboratories Director  
**James S. Peery**





The current modernization programs to extend the life of existing stockpile systems constitute Sandia's largest, most complex design, development and qualification work scope in the last 30 years. Sandia is involved in all stockpile modernization programs currently underway: the B61-12 LEP, W88 ALT 370, W80-4 LEP, W87-1 Modification Program, and the Mk21 Fuze. In addition, Sandia is responsible for the design to extend the life of the Safeguards Transporter and its replacement design (the Mobile Guardian Transporter) for secure transport of nuclear weapon materials and components to the National Nuclear Security Administration (NNSA) partner sites and Department of Defense customer sites. Sandia also has production agency responsibilities for some non-nuclear weapon components (e.g., neutron generators and trusted, strategic radiation-hardened microsystems).

## Nuclear Weapons Products and Essential Capabilities

At the core of Sandia's nuclear weapons responsibilities are these key elements:

- Warhead systems engineering and integration
- Arming, fuzing, and firing systems
- Neutron generators to initiate nuclear fission
- Gas transfer systems
- Safety and surety systems

These science and engineering capabilities underpin Sandia's nuclear weapons program including:

- Environmental shock, vibration, and temperature testing
- Materials science
- Nanodevices and microsystems
- Engineering sciences
- High-performance computing, information sciences, and simulation
- Radiation effects and high energy-density science
- Bioscience and geoscience

While nuclear weapons represent Sandia's core mission, the science, technology, engineering and program management required for this mission enable other critical national security work. At the same time, the nuclear weapons enterprise benefits from strong programs in these other national security areas and from Sandia's fundamental research.

Examples include:

- Global monitoring systems for nuclear material detection
- Tools for the warfighter to safely disable improvised explosive devices, made possible by expertise in explosives required in the nuclear weapons mission
- Small, lightweight, high-resolution, all-weather synthetic aperture radar – SAR – that benefits conventional military and civilian operations, enabled by expertise in nuclear weapons work in radar-related areas
- Cyber defense applications based on decades of work in the command and control of nuclear weapons

## Special Mission in Safety and Surety

Sandia's responsibility for ensuring the safety and security of the stockpile is vital to national security. Nuclear weapons are designed to be safe in all environments. Science-based principles support the design of safety subsystems that prevent energy from reaching the nuclear explosives components through physical barriers, unite energy requirements that require compatibility for activations, and systems that become inoperable in an accident.

Securing weapons against use by adversaries relies on denying access and on internal features to ensure weapons cannot be detonated. Sandia's fundamental expertise has helped develop formidable physical security systems provided by the U.S. military and the NNSA to deter adversaries as part of its nuclear deterrence mission.



**Sandia  
National  
Laboratories**